S/N 03065

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IC-740

HF ALL BAND TRANSCEIVER

INSTRUCTION MANUAL

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ICOM

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SECTION 1 SPECIFICATIONS

GENERAL

Number of Semiconductors:

Transistors	85
FET	18
IC (Includes CPU)	48
Diodes	247

Frequency Coverage:

1.8MHz ~ 2.0 MHz
3.5MHz ~ 4.0 MHz
7.0MHz ~ 7.3 MHz
10.0MHz ~ 10.5 MHz
14.0MHz ~ 14.35MHz
18.0MHz ~ 18.5 MHz (Receive Only)
21.0MHz ~ 21.45MHz
24.5MHz ~ 25.0 MHz (Receive Only)
28.0MHz ~ 29.7 MHz

Frequency Control:
CPU based 10Hz step PLL synthesizer.
Independent Transmit-Receive Frequency Available on same band.

Frequency Readout:
6 digit 100Hz readout.

Frequency Stability:
Less than 500Hz after switch on 1 min to 60 mins, and less than 100Hz after 1 hour. Less than 1KHz in the range of $-10^{\circ}C$ to $+60^{\circ}C$.

Power Supply Requirements:
DC 13.8V ±15% Negative ground Current drain 20A max. (at 200W input)
AC power supply is available for AC operation.

Antenna Impedance:
50 ohms Unbalanced

Weight:
8.0 Kg

Dimensions:
111mm(H) x 286mm (W) x 374mm(D)

TRANSMITTER

RF Power:
SSB (A_3J) 200 Watts PEP input
CW (A_1), RTTY (F_1), FM (F_3)* 200 Watts input
Continuously Adjustable Output power 10 Watts ~ Max.

Emission Mode:

A_3J	SSB (Upper sideband and Lower sideband)
A_1	CW
F_1	RTTY (FSK)
F_3*	FM

*When optional FM unit is installed.

Harmonic Output:
More than 50dB below peak power output

Spurious Output:
More than 50dB below peak power output

Carrier Suppression:
More than 50dB below peak power output

Unwanted Sideband:
More than 55dB down at 1000Hz AF input

Microphone:
Impedance 1300 ohms
Input Level 120 millivolts typical
Dynamic or Electret Condenser Microphone with Preamplifier

RECEIVER

Receiving System:
Triple Conversion Superheterodyne with continuous Pass-Band Shift Control.

Receiving Mode:
A_1, A_3J (USB, LSB), F_1, F_3*

IF Frequencies:

1st	39.7315MHz
2nd	9.0115MHz
3rd	455KHz

with continuous Pass-Band Shift Control.

Sensitivity:
SSB, CW, RTTY
Less than 0.3 microvolts for 10dB S+N/N (preamp ON)
Less than 0.15 microvolts for 10dB S+N/N
FM* (preamp ON)
Less than 0.3μV for 20dB noise quieting

Selectivity:

SSB, RTTY	2.4KHz at –6dB
	4.5KHz at –60dB
(PBT max.)	2.2KHz at –6dB
	4.2KHz at –60dB
(PBT min)	700Hz at –6dB
	2.0KHz at –60dB
CW (AF Filter)	300Hz at –6dB
FM*	15KHz at –6dB
	30KHz at –60dB

Spurious Response Rejection Ratio:
More than 60dB

Audio Output:
More than 2.6 Watts

Audio Output Impedance:
8 ohms

SECTION 2 FEATURES

ALL BAND, ALL MODE, ALL SOLID STATE

The IC-740 covers all the Amateur HF frequencies from 1.8MHz to 29.9999MHz, including the new three bands of 10MHz, 18MHz and 24MHz. It offers not only SSB, but also CW and RTTY (FM option). All of the circuits in the IC-740, including the driver and final power stages are completely solid state, and provide about 100 watts output.

In addition, the low-pass filters switched by the BAND switch and the band-pass filters selected by an electronic signal from the CPU, make a no tune-up system.

OUTSTANDING RECEIVER PERFORMANCE

The IC-740 employs the ICOM DFM (Direct Feed Mixer) system and up-conversion system to improve a high receiver performance.

The ICOM DFM maintains a system where the incoming signals are directly fed to the first mixer, and the mixer is a high level Double Balanced Mixer developed exclusively by ICOM.

The up-conversion system uses a high side IF i.e., 39.7315MHz and in addition high performance third over-tone crystal filters provide excellent image and IF rejection ratio.

These advanced devices and system give higher spurious response rejection ratio, higher sensitivity and wider dynamic range.

PASS BAND SHIFT CONTROL

The IC-740 has a built-in Pass Band Shift system that allows you to continuously adjust the center frequency of the IF pass-band. By moving the control, you can eliminate interference from a nearby signal, thus providing clear reception. It can also be used as a tone control.

When the PBT switch is pushed in, this system acts as a pass-band tuning system that allows you to continuously adjust the pass-band up to 800Hz from the upper or lower side in SSB and CW. The PBT switch provides better performance to eliminate interference.

DUAL DIGITAL VFO WITH VARIOUS STEPS

The dual digital VFO consists of three digital Phase-Locked-Loops which are controlled by the Microcomputer Control System.

Three tuning frequency resolutions of 10Hz, 100Hz and 1KHz steps can be selected with the TUNING RATE switches.

Two separate VFO's can be used independently in the NORMAL (NOR) operation, and any desired in-band frequencies split transmit/receive can be used in the SPLIT (SPT) operation.

MEMORY CHANNELS

The IC-740 has a frequency memory for each band. Any in-band frequency of the VFO A can be stored into the memory, and it can be recalled at any time.

ADDITIONAL CIRCUITS

The IC-740 has a built-in Noise Blanker, VOX, CW Monitor, APC, SWR detector, and many other circuits for your convenience.

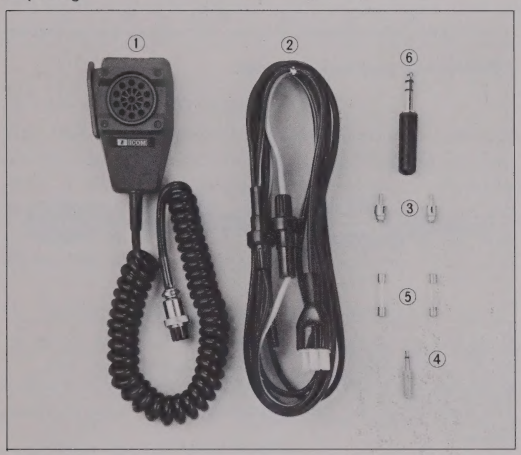
The IC-740 has everything you need to really enjoy HF operation, in an extremely compact, rugged and full featured transceiver.

SECTION 3 INSTALLATION

BE SUARE TO READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE OPERATION

3-1 UNPACKING

Carefully remove your transceiver from the packing carton and examine it for signs of shipping damage. Should any be apparent, notify the delivering carrier or dealer immediately, stating the full extent of the damage. It is recommended you keep the shipping cartons. In the event storage, moving, or reshipment becomes necessary they will be handy. Accessory cables, plugs, etc., are packed with the transceiver. Make sure you have not overlooked anything.



1. Microphone (IC-HM7) 1
2. DC Power Cord. 1
3. Pin Plugs 2
4. External Speaker Plug 1
5. Spare Fuses (20 Amp) 2
6. 3-P Key Plug. 1

3-2 RECOMMENDATIONS FOR INSTALLATION

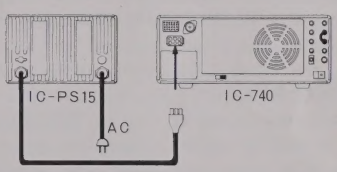
1. Avoid placing the IC-740 in direct sunlight, high temperature, dusty or humid places.
2. The temperature of the set will usually become relatively warm during transmission. Any equipment should be at least 1 inch (3cm) away from the unit so as to provide good ventilation. Be sure that nothing is on and just behind the rear PA heatsink to ensure good ventilation. Also avoid places near outlets of heaters, air conditioners etc.
3. Place the unit so that the controls and switches can easily be handled and the frequency indication and meter can easily be read.
4. For mobile installation, an optional mounting bracket is available. Select the best location that can stand the weight of the unit and that does not interfere with your driving in any way.
5. Use the Ground Lug!

3-3 POWER SUPPLY

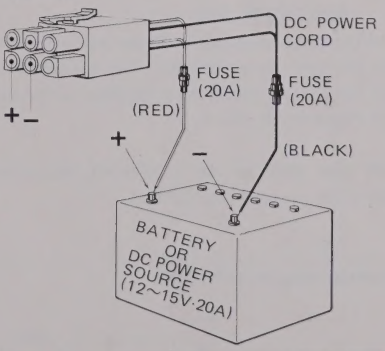
For AC operation, use the special power supply IC-PS15, or optional built-in power supply. If you would like to use your car battery or any other DC power supply, be sure that its output voltage is 12-15 Volts and the current capacity is at least 20 Amps. The maximum power consumption of the set during transmission runs from 16-20 Amps, so keep that in mind if the unit is installed in your automobile, and turn it on after you have started the engine. Attention should also be paid to the condition of the battery and electrical system.

The connection of the DC power cord supplied with the IC-740 is done in the following way: First make sure that the power switch of the unit is in the OFF position and the T/R switch is in the receive position. Connect the cord to the DC power supply with the RED lead to the positive terminal and the BLACK lead to the negative terminal. (Reverse connection will cause the protection circuit to operate and blow the fuse.) Connect the DC plug to the socket on the rear panel of the IC-740. Refer to the drawing below.

For AC operation



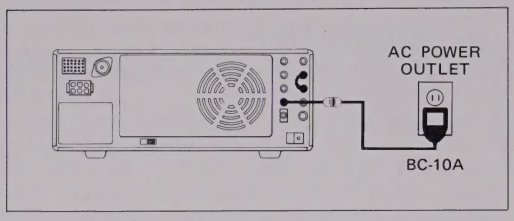
For DC operation



3-4 MEMORY BACK-UP

To retain the memory in the CPU, keeping the operating frequencies of the VFOs even when the main Power Switch is turned OFF, connect a power source of 9 to 12 Volts DC to the Memory Back-Up terminal on the rear panel. For mobile installation this can be accomplished by direct connection to the car battery, since the current drain is low.

For AC operation it is recommended that the optional BC-10A be used.



3-5 ANTENNA

Antennas play a very important role in radio communication. If the antenna is inferior, your transceiver cannot give you the best performance. With a good antenna and feeder cable having 50 ohm impedance, you should easily get the desired matching and performance. Carefully install a high performance antenna that suits the frequency band(s) you wish to operate on and place it as high as possible. Be especially carefull of the condition of the connectors as loose connections will deteriorate the performance. Be sure to connect the ground terminal of a whip antenna, if used, to the body of your car.

As the output is quite high avoid connecting the antenna connector to open lines and do not transmit under mismatched conditions. Otherwise the final stage could be overloaded and cause a malfunction of the unit.

3-6 GROUND

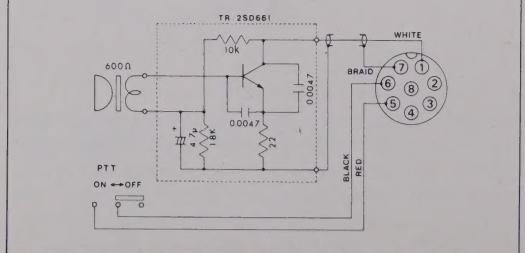
In order to prevent electrical shocks, TVI, BCI and other problems, be sure to connect a heavy wire ground, as short as possible, from a good earth point to the ground terminal on the rear panel.

3-7 MICROPHONE

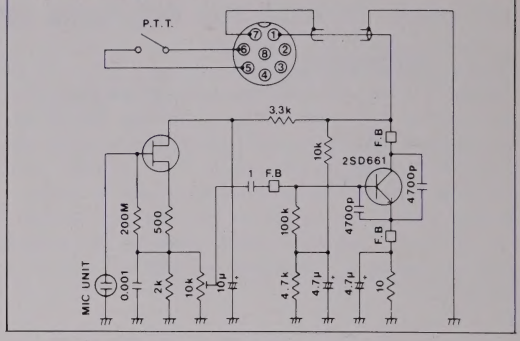
The microphone supplied with the IC-740 is the IC-HM7 which contains a preamplifier. The optional electret condenser type stand microphone IC-SM5 can be used. Their circuit diagrams are shown.

Should you wish to use a different microphone, make certain it has a proper preamplifier.

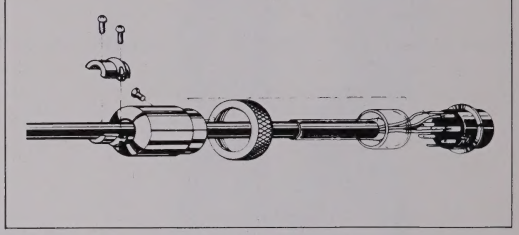
Schematic diagram of IC-HM7



Schematic diagram of IC-SM5



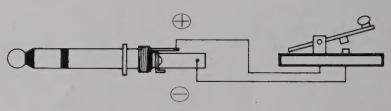
Microphone plug exploded view



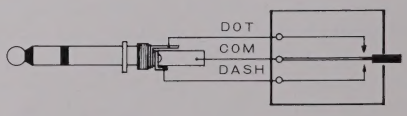
3-8 CW KEY

When operating CW, connect a key to the Key Jack with a 1/4 inch 3-P plug. The connection of the plug is shown below.

Wiring for a hand key or external electronic keyer.



Wiring for an iambic paddle (when optional keyer unit is installed.)



If the terminals have polarity, be sure to make the correct connection. Note that the keyed voltage when switching with semiconductors or relays with resistors in the circuit, should be adjusted to be below 0.4 Volts!

3-9 EXTERNAL SPEAKER

The IC-740 contains an internal speaker, and is also designed so that it can drive an external speaker from the

external (EXT) speaker jack on the rear panel. Be sure the impedance of the external speaker is 8 ohms, and remember that with the external speaker connected, the internal speaker is disabled.

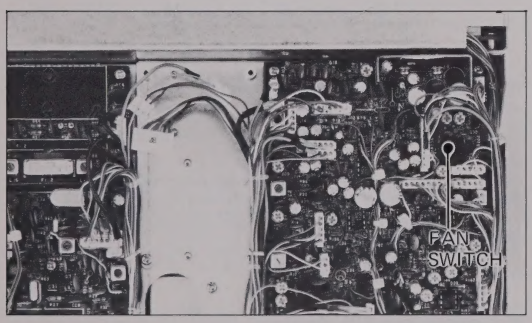
3 - 10 HEADPHONES

Any good headphone set, including stereo type, that have 4-16 ohms impedance can be used. With the plug inserted halfway into the PHONES jack, both the headphone and speaker will operate. This is convenient when others wish to listen in on the station, or you wish to record contacts using a tape recorder connected to the headphone jack. With a stereo headphone set inserted this way, however, the headphone will lose the sound on one side. With the plug inserted completely, only the headphone works.

3 - 11 COOLING FAN

The rear of the PA unit is designed to provide for adequate cooling, but with 200 Watt input the final stage produces quite a bit of heat, and its temperature may rise during prolonged transmissions. The fan is connected to a temperature monitoring circuit which monitors the temperature of the final stage. The fan operates as follows:

1. The fan does not operate in the receive mode.
2. When you slide the FAN switch located on the MAIN unit under the top cover (Refer to the picture shown below.) toward the front panel side, the cooling fan will operate during both transmit and receive modes to provide more efficient cooling.



3. When the temperature rises to a point (75°C) detected by the monitor circuit the fan will operate during both transmit and receive and much more rapidly to provide additional cooling. At this time stop transmitting and investigate the cause of overheating i.e., antenna mismatch, etc. Correct the cause of the overheating before starting to transmit again.

3 - 12 POWER SUPPLY

It is recommended that you use the IC-PS15 as a power supply for base station operation. If you wish to use another type of power supply make sure that it meets the voltage, current requirements. Note carefully the over-voltage protection, for a runaway regulator can destroy the IC-740; be especially careful that a voltage of more than 16 Volts cannot be supplied to the transceiver. Do not connect the power supply, antenna, accessory plug, or microphone with the Power Switch in the ON position. Be especially careful not to transmit without an antenna or dummy load hooked up. If the fuse blows replace it with a 20 Amp fuse, only after fixing the cause. Do not turn the Power Switch ON and OFF repeatedly for this may cause the readout to mis-display. Should this occur, turn the set OFF and wait for approximately 30 seconds before turning it back ON.

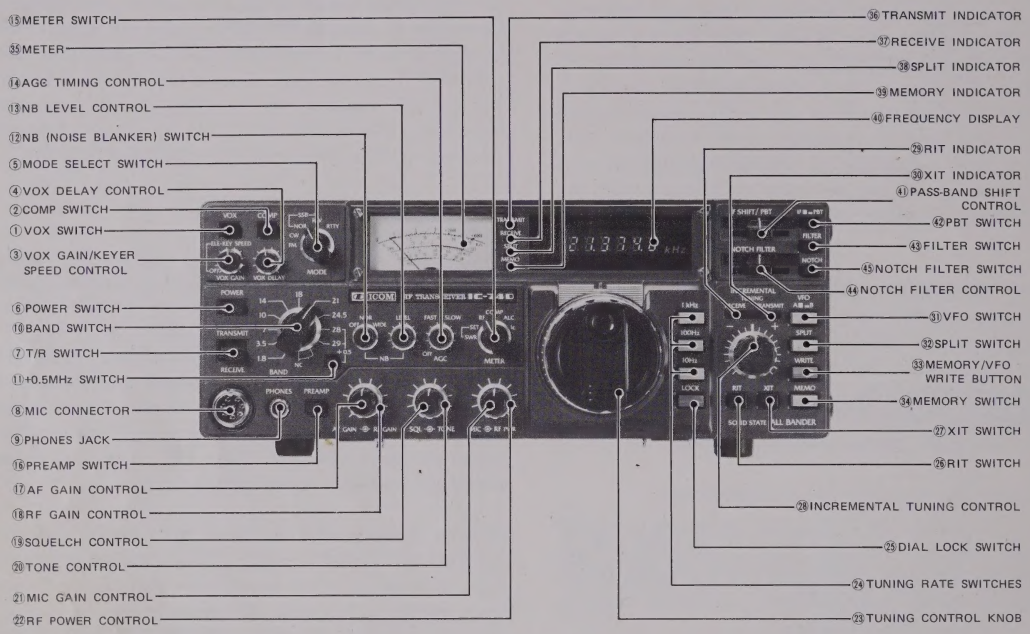
3 - 13 CAUTIONS

As the unit has already been closely adjusted with highly sophisticated measuring instruments, never tamper with the turnable resistors, coils, trimmers, etc.

C-MOS is used in the Logic unit as well as the PLL. C-MOS ICs are very susceptible to excessive static charges and over current and care must be used when handling them. Therefore, avoid touching the Logic unit and the nearby circuitry unless absolutely necessary. When it is necessary to check the circuitry, observe the following points.

Ground all measuring instruments, the soldering iron, and other tools. Do not connect or disconnect the C-MOS IC from its socket, or solder it when the power is on. Do not apply voltage of less than −0.5 or more than +5 Volts to the input terminals of the IC. DO NOT MEASURE WITH AN OHMMETER.

4 - 1 FRONT PANEL



1. VOX SWITCH

This switches the VOX circuit ON and OFF. When it is in the ON (in) position, in SSB or FM, T/R switching is accomplished by means of a voice signal. In CW operation, semi-break-in switching by means of keying is possible.

2. COMP (SPEECH PROCESSOR) SWITCH

Switches the speech processor circuit ON and OFF. This circuit enables greater talk power and better results in DX operation.

3. VOX GAIN/KEYER SPEED CONTROL

This control adjusts input signal level via the microphone to the VOX circuit. For VOX operation in SSB and FM, adjust the control so that the VOX circuit will operate with normal speech.

When the optional electronic keyer unit is installed and the set is in CW mode, this control adjusts keying speed of the keyer.

4. VOX DELAY (VOX time constant) CONTROL

This controls the transmit to receive switching time. Adjust it so transmit to receive switching will not occur during short pauses in normal speech.

5. MODE SELECT SWITCH

Selects any one of four operating modes (FM is option). There are two modes in SSB mode as follows:

SSB-NOR: For normal SSB operation, upper sideband (USB) for 10MHz band and above, and lower sideband (LSB) for 7MHz band and below.

SSB-REV: For reverse SSB operation, lower sideband (LSB) for 10MHz band and above, and upper sideband (USB) for 7MHz band and below.

6. POWER SWITCH

The POWER SWITCH is a push-lock type switch which controls the input DC power to the IC-740. When the external AC power supply (IC-PS15) or optional built-in

AC power supply is used, the switch also acts as the AC power supply switch. When the switch is pushed in and locked, power is supplied to the set. When the switch is pushed again and released, power is cut to all circuits except the PA unit. When the BC-10A is used, power will also be supplied to the CPU. (Refer to page 3.)

7. T/R (TRANSMIT/RECEIVE) SWITCH

This switch is for manually switching from transmit to receive and vice versa. Set the switch to RECEIVE (down) and the IC-740 is in the receive mode. Set the switch to TRANSMIT (up) and it switches to transmit. When switching with the PTT switch on the microphone or with the VOX switch set to ON, the T/R switch must be in the RECEIVE position.

8. MIC CONNECTOR

Connect the supplied microphone or optional microphone, IC-SM5 or IC-HM11 to this jack. If you wish to use a different microphone, refer to the drawing on page 4.

9. PHONES JACK

Accepts a standard 1/4 inch headphone plug for headphones of 4 ~ 16 ohms. Stereo phones can be used without modification.

10. BAND SWITCH

The BAND SWITCH is a 10 position rotary switch used for selecting one of the 500KHz segments. The selectable bands are 1.8MHz, 3.5MHz, 7MHz, 10MHz, 14MHz, 18MHz, 21MHz, 24MHz and 28MHz. (28MHz band is separated to four 500KHz segments, and use ⑪ + 0.5MHz switch for upper 500KHz segments on 28MHz and 29MHz.)

11. +0.5MHz SWITCH

This switch is for selecting upper 500KHz segment on 28MHz or 29MHz band. This switch is negated when the other band is selected.

12. NB (NOISE BLANKER) SWITCH

When pulse type noise such as automobile ignition noise is present, set this switch to the NOR or WIDE position. The noise will be reduced to provide comfortable reception.

The blanking time can be selected NORMAL and WIDE by this switch. It will be effective against any type noises.

13. NB LEVEL CONTROL

Controls the threshold level of the noise blanker. Adjust the control so that incoming noises will be disappeared.

14. AGC TIMING CONTROL

For changing the time-constant of the AGC (Automatic Gain Control) circuit. By turning the control clockwise, the AGC voltage is released more slowly. Adjust the control to provide comfortable reception.

When the control is in the OFF position, the AGC function is turned OFF and the S-meter does not swing even if a signal has being received. (The AGC does not actuate on the FM mode.)

15. METER SWITCH

In the transmit mode, the meter has five functions.

1. Ic	Indicates the collector current of the final transistors.
2. ALC	Indicates the ALC level. The meter begins to function when the RF output power reaches a certain level.
3. COMP	Indicates the compression level when the speech processer is in use.
4. RF	Indicates an approximate RF output power.
5. SET/SWR	SWR can be measured by setting this switch to the SET position and calibrating the meter needle to the "SET" position with the RF POWER control, then setting this switch to the SWR position.

16. PREAMP SWITCH

Switches the preamplifier for the receiver.

17. AF GAIN CONTROL

Controls the audio output level in the receive mode. Clockwise rotation increases the level.

18. RF GAIN CONTROL

Controls the gain of the RF section in the receive mode. Clockwise rotation gives the maximum gain. As the control is rotated counterclockwise, the needle of the METER rises, and only signals stronger than the level indicated by the needle will be heard.

19. SQUELCH CONTROL

Sets the squelch threshold level. To turn OFF the squelch function, rotate this control completely counterclockwise. To set the threshold level higher, rotate the control clockwise.

20. TONE CONTROL

Controls the receiver audio tone. Ajust the control to provide comfortable reception.

21. MIC GAIN CONTROL

Adjusts the level of modulation according to the input of the microphone. Clockwise rotation increases the microphones gain. As the input will vary with different microphones and different voices, the knob should be turned until the Meter needle, in the ALC mode, begins to move slightly within the ALC zone. In the SSB mode when the speech processor is in use, the MIC GAIN CONTROL sets a clipping limit, while the RF POWER CONTROL sets the RF drive level to the maximum power level, where ALC starts at the saturation point of the amplifiers.

22. RF POWER CONTROL

Controls the RF output power 10 Watts to maximum (SSB: 100 Watts PEP, CW, RTTY: 100 Watts). Clockwise rotation increases the output power.

23. TUNING CONTROL KNOB
Rotating the TUNING CONTROL KNOB clockwise increases the frequency, while rotating it counterclockwise decreases the frequency. The frequency is changed in 10Hz, 100Hz or 1KHz steps which is according to the TUNING RATE switches. One complete rotation of the tuning knob results in a 1KHz frequency increase or decrease in 10Hz steps, 10KHz in 100Hz steps and 100KHz in 1KHz steps.

When the 10Hz steps tuning rate is selected, by turning the tuning control knob faster, the 100Hz steps tuning rate is automatically selected. This makes it very convenient to make a QSY over a wide frequency range.

24. TUNING RATE SWITCHES
The small vernier marks on the tuning knob are changed to correspond to 10Hz, 100Hz or 1KHz steps which is selected by pushing the switch either 10Hz, 100Hz or 1KHz.

25. DIAL LOCK SWITCH
After the IC-740 is set to a certain frequency for rag chewing, mobile operation, etc., by pushing the DIAL LOCK switch, the VFO is electronically locked at the displayed frequency, thus inactivating the operation of the tuning knob. To change frequency, the dial lock must first be disengaged by pushing and releasing the DIAL LOCK switch again.

26. RIT SWITCH
Switches the RIT (Receiver Incremental Tuning) circuit ON and OFF.

27. XIT SWITCH
Switches the XIT (Transmitter Incremental Tuning) circuit ON and OFF.

28. INCREMENTAL TUNING CONTROL
Shifts the receive frequency ±1.5KHz to either side of the transmit frequency when the RIT is ON, and shifts the transmit frequency to either side of the receive frequency when the XIT is ON. Rotating the control to the (+) side raises the receive or transmit frequency, and rotating to the (–) side lowers the receive or transmit frequency. The frequency shift by turning the control is not indicated on the frequency display.

When both the RIT and XIT switches are ON, the receive and transmit frequencies are the same, and this frequency can be shifted either side from the displayed frequency by the control.

29. RIT INDICATOR
Illuminates when RIT is turned ON.

30. XIT INDICATOR
Illuminates when XIT is turned ON.

31. VFO SWITCH
You can select either of the two built in VFO's with this switch. It also selects the relationship of the two VFO's with the SPLIT switch. The switch performs the following operations according to its position.

A. (NORMAL) Selects the "A" VFO for both transmit and receive.

A. (SPLIT) Selects "A" VFO for receive and "B" VFO for transmit.

B. (NORMAL) Selects the "B" VFO in both transmit and receive.

B. (SPLIT) Selects "B" VFO for receive and "A" VFO for transmit.

32. SPLIT (TRANSCEIVE/SPLIT) SWITCH
Selects the relationship of the two VFO's. In the NORMAL (out) position, one VFO is for both transmit and receive. In the SPLIT (in) position, one VFO is for transmit and the other is for receive.

33. MEMORY/VFO WRITE BUTTON
By pushing this button, A VFO's frequency is written into Memory, or one VFO's frequency is transfered to the other VFO.

34. MEMORY SWITCH
Push this switch when you wish to write a frequency into memory, or to call a memorized frequency.

35. METER
When in the receive mode the meter acts as an S meter regardless of the position of the meter select switch. Signal strength is indicated on a scale of S1-S9, and S9 to S9+60dB.

In the transmit mode the meter has five functions which are selected by the Meter Switch (15).

36. TRANSMIT INDICATOR
Illuminates when the transceiver is in the transmit mode.

37. RECEIVE INDICATOR
Illuminates when the squelch is opened in the receive mode.

38. SPLIT INDICATOR
Illuminates when the transceiver is in the split frequency operation.

39. MEMORY INDICATOR
Illuminates when the memory switch is pushed ON.

40. FREQUENCY DISPLAY
The frequency of the IC-740 is displayed on a luminescent display tube. Since the 1MHz and 1KHz decimal points are displayed, the frequency can easily be read. The frequencies indicated are the carrier frequencies of each mode in, USB, LSB and CW, and the mark frequency in RTTY.

Remember, if you turn the RIT or XIT SWITCH ON to change the frequency and rotate the INCREMENTAL

TUNING CONTROL knob, the frequency displayed will not change.

41. PASS-BAND SHIFT (TUNING) CONTROL
Allows continuous shifting of the pass-band from upper or lower side in SSB, CW and RTTY. This will reduce interference by a nearby signal. When the PBT switch is pushed ON, this control allows continuous tuning of the pass-band selectivity by moving the filter up to 800Hz from the upper or lower side in SSB, CW and RTTY. This not only improves selectivity, but also can improve the audio tone. Normal position is in the center position and is 2.4KHz wide in SSB.

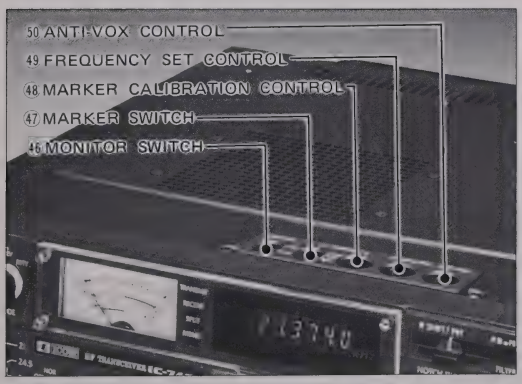
42. PBT SWITCH
Switches the IF SHIFT function and PASS-BAND TUNING function.

43. FILTER SWITCH
Selects the combination of the second IF (9MHz) filter and the third IF (455KHz) filter to improve the selectivity.

44. NOTCH FILTER CONTROL
Shifts the notch filter frequency. Adjust the control so that the interference is reduced.

45. NOTCH FILTER SWITCH
Switches the notch filter function ON and OFF.

4 - 2 TOP COVER



46. MONITOR SWITCH
In the SSB transmit mode, the transmitting IF signals can be monitored by turning this switch ON. At this time, use headphones or reduce receiver audio volume to prevent howling.

47. MARKER SWITCH
When an optional marker oscillator unit is installed, this switch turns the marker oscillator ON or OFF.

The marker frequency is available on every 25KHz or 100KHz step.

48. MARKER CALIBRATION CONTROL
Calibrates the marker frequency with a standard frequency such as WWV.

49. FREQUENCY SET CONTROL
This control is for fine adjustment of the reference frequency of the PLL unit, which is local oscillator frequency. Do not turn it unless you want to change the frequency.

50. ANTI-VOX CONTROL
In VOX (SSB) operation, the VOX circuit may be operated by sound from the speaker causing a switch to transmit. This trouble can be prevented by adjusting the input level of the ANTI-VOX circuit with this control along with the VOX gain control so that the VOX circuit only operates by the operator's voice, not by sound from the speaker.

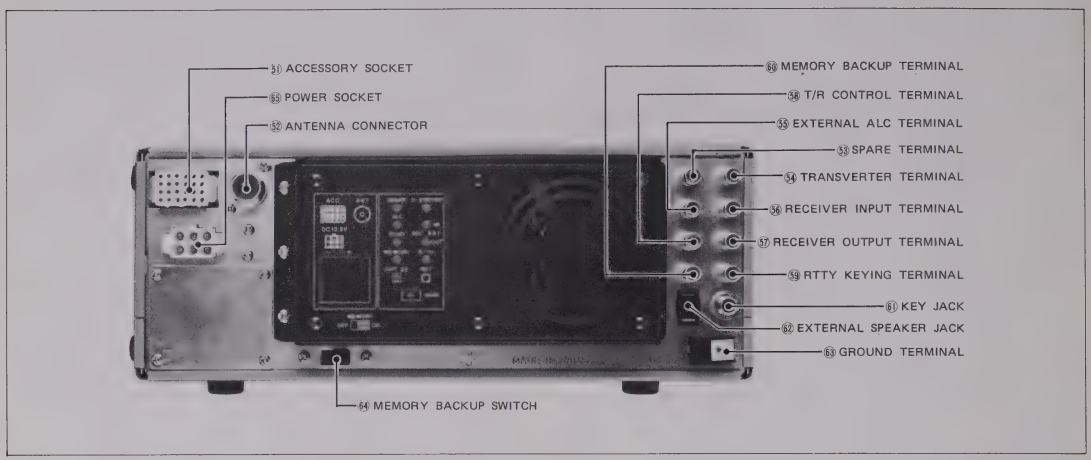
4 - 3 REAR PANEL CONNECTIONS

51. ACCESSORY (ACC) SOCKET
Various functions are available through the accessory socket such as modulation output, receiver output, T/R change-over, and so forth. The table below shows those terminals.

ACC SOCKET CONNECTIONS

Outside view

PIN No.	FUNCTION
1.	Output from the discriminator circuit (When optional FM unit is installed).
2.	13.8 Volts DC in conjunction with the power switch operation.
3.	Connected to Push-to-talk, T/R change-over switch. When grounded, the set operates in the transmit mode.
4.	Output from the receive detector stage. Fixed output regardless of AF output or AF gain.
5.	Output from Transmitter MIC amplifier stage. (Input for MIC gain control stage.)
6.	8 Volts DC available when transmitting. (relay can not be directly actuated. Max. 5mA).
7.	Input for external ALC voltage.
8.	Ground
9.	NC (no connection)
10.	8 Volts DC available when the 28MHz band is selected.
11.	Input for TRANSVERTER control. When 8 Volts DC is applied, the set can operate with a transverter.
12.	Output reference voltage for band switching.
13.	Output for external band switching.
14.~24.	NC



52. ANTENNA (ANT) CONNECTOR

This is used to connect an antenna to the set. Its impedance is 50 ohms and connect with a PL-259 connector.

53. SPARE TERMINAL

This terminal is available for your personal use, such as for adding accessory circuit, etc., if desired.

54. TRANSVERTER TERMINAL

VHF and UHF operation using a suitable transverter with the IC-740 is possible. This terminal is for Transverter connection. The output is a few milliwatts.

55. EXTERNAL ALC TERMINAL

This terminal can be used for input terminal of external ALC signal from a linear amplifier or transverter.
The ALC voltage should be in 0V ~ –4V.

56. RECEIVER INPUT TERMINAL

This is an input terminal which is connected directly to the receiver.

57. RECEIVER ANTENNA OUTPUT TERMINAL

This is a terminal to which received signals from the antenna connector are conducted after the signal passes through the transmit/receive antenna switching circuit. Usually the receiver IN and OUT terminals are jumpered. The receiver antenna output terminal is usually used when another receiver is used or a preamplifier is connected to the IC-740A.

58. T/R CONTROL TERMINAL

Controls Transmit/Receive for an external linear amplifier or transverter. This terminal can be used to switch 24V 1A DC. Don't exceed this limit.

59. RTTY KEYING TERMINAL

This terminal is for RTTY keying (Frequency Shift Keying). The keying signals should be H-level (+5V) for the MARK and L-level (0V) for the SPACE.

60. MEMORY BACKUP TERMINAL

For connection of a 9 ~ 12V DC power supply. For mobile installation the current drain is low, so connection to the vehicle's battery can be made. For fixed installation use of the IC-BC10A is recommended.

61. KEY JACK

For CW operation, connect a key here using a standard 1/4 inch 3-P plug. For electronic keying the terminal voltage must be less than 0.4V DC.

When an optional electronic keyer unit is installed, an iambic keyer paddle can be used with a 1/4 inch 3-P plug.

62. EXTERNAL SPEAKER JACK

When an external speaker is used, connect it to this jack. Use a speaker with an impedance of 8 ohms. When the external speaker is connected, the built-in speaker does not function.

63. GROUND TERMINAL

To prevent electrical shock, TVI, BCI and other problems, be sure to ground the equipment through the GROUND TERMINAL. For best results use as heavy a gauge wire or strap as possible and make the connection as short as possible, even in mobile installations.

64. MEMORY BACKUP SWITCH

When this switch is in the ON position, the power to the CPU of the set is supplied continuously, if you use the optional built-in power supply or memory backup power source, even when the POWER switch on the front panel is turned OFF. At this time, the programmed frequencies in the memory channels, the operating frequencies of the two VFO's are also retained.

When this switch is set at the OFF position, all the power, including that to the CPU, is turned OFF by turning the POWER switch OFF, so that all frequencies are erased.

65. POWER SOCKET

This is for connection of the IC-PS15's DC power cord, or other suitable power supply.

5-1 HOW TO TUNE

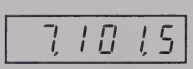
The following instructions are for tuning in any mode. Please read carefully and understand fully before turning ON your unit. Proper tuning is necessary for optimum operation.

5-1-1 FREQUENCY DISPLAY ON EACH MODE

When the set is first turned ON, the following readouts will appear on the FREQUENCY DISPLAY.

Band	Displayed Frequency (MHz)		
	CW·RTTY·FM	LSB	USB
1.8MHz	1.600.0	1.601.5	1.598.5
3.5 "	3.600.0	3.601.5	3.598.5
7 "	7.100.0	7.101.5	7.098.5
10 "	10.100.0	10.101.5	10.098.5
14 "	14.100.0	14.101.5	14.098.5
18 "	18.100.0	18.101.5	18.098.5
21 "	21.100.0	21.101.5	21.098.5
24.5 "	24.600.0	24.601.5	24.598.5
28 "	28.100.0	28.101.5	28.098.5
28.5 "	28.600.0	28.601.5	28.598.5
29 "	29.100.0	29.101.5	29.098.5
29.5 "	29.600.0	29.601.5	29.598.5

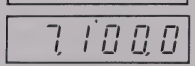
EXAMPLE:
When the 7MHz band and LSB are selected, the display will be as follow:



When changing to other modes, the display will be as follows:

USB:

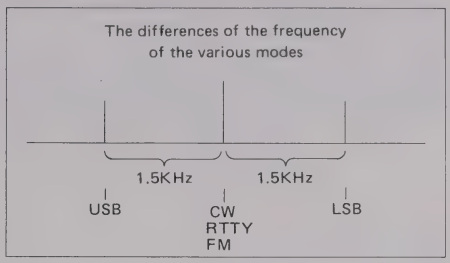
CW:

RTTY: 

FM:

The displayed frequency shows the carrier frequency. To avoid the trouble of recalibrating the dial when you change the operating mode, the displayed frequency is set to shift to the carrier frequency of each mode automatically. For the differences of frequency shifts of the various modes, refer to the following figure.

When changing to other bands, 100KHz and lower digits of the frequency display will remain as it had in the previous display.



EXAMPLE:
When the frequency display shows 14.255.5MHz, and if you switch to the 21MHz band, and the frequency display will show 21.255.5MHz. (When you switch to the 3.5MHz band, it will show 3.755.5MHz.)

5-1-2 TUNING CONTROL KNOB

The transmit or receive frequency is displayed on a 7 segment Electroluminescent display down to 100Hz digits. Rotating the tuning knob clockwise increases the frequency, while turning counterclockwise decreases the frequency in which stops are selected by the TUNING RATE switches, i.e., 10Hz, 100Hz or 1KHz steps.

When the 10Hz steps tuning rate is selected, by turning the tuning control knob faster, the 100Hz steps tuning rate is automatically selected.

One complete rotation of the tuning knob results in 1KHz with 10Hz steps, 10KHz with 100Hz steps, or 100KHz with 1KHz steps with a frequency increase or decrease.

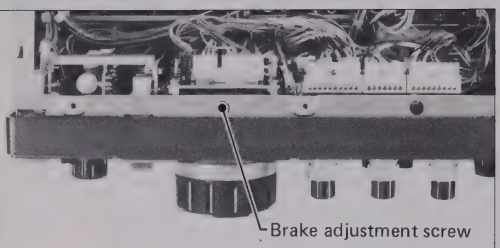
Exact calibration is not necessary as the displayed frequency will always be correct but you may calibrate the scale on the tuning knob for use as an analog type frequency display.

If you want to calibrate the scale during operation, set the frequency readout to 0.0KHz, push the dial lock switch, then set the large increment on the tuning scale to line up with the indicator arrow and then push the dial lock switch again.

The tuning knob scale may require recalibration if you:

1. Turn the knob while the frequency is locked by use of the Dial Lock switch.
2. Turn the knob beyond the band edge.

Brake Adjustment
If the knob is too loose or too stiff for comfortable use, you can adjust the torque by tightening or loosening the brake adjustment screw accessible from underneath the set.



(It is unnecessary to remove the bottom cover for the brake adjustment.)

The following instructions should be used to adjust the tension of the Tuning Knob.

1. The Tuning knob tension will become tighter by turning the brake adjustment screw clockwise, and will become looser by turning the screw counterclockwise.
2. While performing this adjustment, the Tuning knob must be turned continuously as the screw is adjusted in order to set the tension for a comfortable touch.

The displayed frequency will not go beyond the highest band edge even by turning the tuning knob clockwise, or beyond the lowest band edge by turning the knob counterclockwise.

The frequency range of each band is shown in the following chart.

Band	Frequency Range (MHz)
1.8	1.400.0 ~ 2.099.9*
3.5	3.400.0 ~ 4.099.9
7.0	6.900.0 ~ 7.599.9
10.0	9.900.0 ~ 10.599.9
14.0	13.900.0 ~ 14.599.9
18.0	17.900.0 ~ 18.599.9
21.0	20.900.0 ~ 21.599.9
24.0	24.400.0 ~ 25.099.9
28.0	27.900.0 ~ 28.599.9
28.5	28.400.0 ~ 29.099.9
29.0	28.900.0 ~ 29.599.9
29.5	29.400.0 ~ 29.999.9

*NOTE: In the range of 2.000.0 ~ 2.099.9, the frequency display will show as 1.000.0 ~ 1.099.9.

5-1-3 TUNING RATE SWITCHES

Pushing one of the Tuning Rate switches will change the basic tuning rate of the set.

When the 10Hz switch is pushed, the tuning rate becomes 10Hz. The 10Hz may be read from the increments on the tuning knob.

When the 100Hz switch is pushed, the tuning rate becomes 100Hz.

When the 1KHz switch is pushed, the tuning rate is changed to correspond to 1KHz steps. The last significant-digit on the display will remain as the previous one. This position will allow you to quickly QSY over a great frequency range.

5-1-4 DIAL LOCK SWITCH

After the IC-740 is set at a certain frequency for rag chewing, mobile operation, etc., by pushing the Dial Lock switch the VFO is locked at the displayed frequency, thus inactivating the operation of the tuning knob. To change the frequency, the Dial Lock must first be disengaged by pushing and releasing the Dial Lock switch again.

5-1-5 VFO SWITCH

The CPU in the IC-740 contains two "VFO's" for both receiving and transmitting. The VFO's are labeled "A" VFO and "B" VFO and are selectible with the VFO Switch. This dual VFO system gives the IC-740 many very convenient features. Please read this section very carefully and perform the operation several times until you are comfortable with the system.

1. "A" VFO is for both transmitting and receiving and is selected by placing the VFO switch in the "A" position. The transmit and receive frequency will be controlled by "A" VFO, displayed on the frequency readout, and stored in "A" memory.

2. "B" VFO is for both transmitting and receiving and is selected by placing the VFO switch in the "B" position. The transmit and receive frequency will be controlled by "B" VFO, displayed on the frequency readout, and stored in "B" memory.

EXAMPLE:

When the set is turned ON (7MHz and LSB are selected), 7.101.5 will be displayed on the readout.
This will occur whether the VFO switch is in either the "A" or "B". Rotating the tuning knob clockwise will increase the frequency in 100Hz (10Hz or 1KHz) steps. Rotating the tuning knob counterclockwise will decrease the frequency in 100Hz (10Hz or 1KHz) steps.

■ Switching from one VFO to the other VFO does not clear the first VFO. The frequency is retained in VFO's memory.

EXAMPLE:

If 14.125.0MHz is set with "A" VFO, and the VFO switch is set to "B" VFO, the frequency readout will show "B" VFO's frequency, but 14.125.0MHz is still stored in "A" VFO's memory. Returning the VFO switch to "A" VFO position, and 14.125.0 will be displayed on the readout. Accordingly, if the switch is placed in the "B" VFO position, the frequency that was set with the "B" VFO will

appear. This allows you to set a certain frequency with one VFO, work up and down the band with the other VFO, and periodically check the set frequency simply by switching between "A" and "B" VFO. It also allows you to search for a clear frequency with one VFO, while keeping your operating frequency on the other VFO. When you have found a clear frequency, switch back to your operating frequency, inform the station you are in contact with of the new frequency, and switch back. It's that simple!

5-1-6 SPLIT SWITCH

Pushing the SPLIT switch will change the relationship of the two VFO's. In the NORMAL (out) position, one VFO is for both transmit and receive. In the SPLIT (in) position, one VFO is for transmit and the other is for receive, so that this will allow you to operate split transmit/receive frequencies on the same band.

EXAMPLE:
Set "A" VFO to 7.085.0MHz and "B" VFO to 7.255.0 MHz.

Return the VFO Switch to "A" VFO then set the SPLIT Switch to the SPLIT position. 7.085.0MHz will be shown on the readout during receive ("A" VFO) and 7.255.0MHz during transmit ("B" VFO). You are now receiving on 7.085.0MHz and transmitting on 7.255.0MHz. Setting the VFO switch to "B" VFO to reverse the above.

5-1-7 RIT (RECEIVE INCREMENTAL TUNING)

By using the RIT circuit, you can shift the receive frequency ±1.5KHz either side of the transmit frequency without moving the transmit frequency itself. Therefore, when you get a call slightly off frequency, or when the other station's frequency has shifted, you can tune in the frequency without disturbing the transmitting frequency. By pushing the RIT switch the RIT circuit is turned ON and the RIT Indicator is lit.
The receive frequency can be shifted with the INCREMENTAL TUNING Control knob.

When the Control knob is in the "0" position, the transmitting and receiving frequencies are the same.

Rotating the control to the (+) side raises the receiving frequency, and rotating to the (—) side lowers the frequency. To turn OFF the RIT function, again push and release the RIT switch and the RIT Indicator will go OFF. When the RIT circuit is OFF, the transmit and receive frequencies are the same regardless of the setting of the control knob.

NOTE: The RIT circuit is operational when the frequency is locked with the dial lock switch. The frequency shifted by turning the INCREMENTAL TUNING control is not indicated on the frequency display. When the transmitting and receiving frequencies differ by more than 1.5KHz, use "A" and "B" VFOs.

5-1-8 XIT (XMITTER INCREMENTAL TUNING)

You can shift the transmit frequency ±1.5KHz on either side of the receive frequency without moving the receive frequency the same function as the RIT by using the XIT circuit.

By pushing the XIT switch, the XIT circuit is turned ON and the XIT Indicator is lit.
The transmit frequency can be shifted with the INCREMENTAL TUNING Control.

NOTE: When both the RIT and XIT switches are pushed, the receive frequency and transmit frequency become the same frequency, and it can be shifted to either side from the displayed frequency by the INCREMENTAL TUNING control.

5-1-9 MEMORY/VFO WRITE BUTTON

This button allows desired frequencies to be written into the memories for each band, and allows either VFO's to be brought to the exact frequency of the other VFO without turning the tuning knob. Therefore, it is very easy to make a few KHz split transmit/receive frequencies.

EXAMPLE:
When "A" VFO is 14.255.5MHz and "B" VFO is 14.355.0 MHz, pushing the VFO switch to select "B" VFO, then the MEMORY/VFO WRITE button, "B" VFO's frequency becomes the same as "A" VFO's (14.255.5MHz). Now the "A" VFO's frequency is memorized in the "B" VFO, and you can operate anywhere with "A" VFO or "B" VFO. When you want to return to the previous frequency (14.255.5MHz), switch back to the other VFO. It's very easy. Also, you can make several KHz split frequency operations with "A" VFO and "B" VFO, within a few moments. To reverse this (A the same as B), select "A" VFO first, then push the MEMORY/VFO WRITE button.

5-1-10 MEMORY OPERATION

MEMORY-WRITING
Only "A" VFO can be used for memory-writing.

1. Set the TUNING CONTROL knob to the desired frequency, using "A" VFO. For example, set it for 14.255.5MHz on the display (when 14MHz and USB are selected).
2. Push the MEMORY Switch. If no frequency has been programmed since turning the power of the unit ON, 14.098.5 (14MHz, USB) will be shown on the display and the unit will receive on this frequency.
3. One push of the MEMORY/VFO WRITE Button erases the previous programmed frequency (14.098.5) and programs the new frequency (14.255.5) into memory.
4. Program any desired frequency into memory for each band in the same manner.
5. There is a memory for each band. The 28MHz band consists of four segments, and there is a memory for each one. However, the memory can be used for all segments. For example when 28.055.0 is written in the memory, it can be used for 28.555.0, 29.055.0 and 29.555.0MHz also.

Also, there is only one memory for 1.8MHz and 3.5MHz bands. However the memory can be used for the both bands. For example, when 1.805.5 is written in the memory, it can be used for 3.805.5 as well.

MEMORY-READING
Just push the MEMORY Switch. At whichever frequency the "A" or "B" VFO has been set, that previously programmed frequency is recalled. When the MEMORY Switch is pushed again and released, the previous operating frequency of that VFO will again be shown on the display.

The programmed frequencies in the memories are maintained as long as the power, including MEMORY BACKUP power, of the set is not turned OFF, or new frequency reprogrammed. When a MEMORY BACKUP power source is connected, all programmed frequencies in the memories and the operating frequencies of both "A" and "B" VFO's are retained even when the POWER Switch is turned OFF.

5 - 2 SSB OPERATION

5 - 2 - 1 RECEIVING

After connecting an antenna, microphone, etc., set knobs and switches as follows.

POWER SWITCH	OFF (OUT)
T/R SWITCH	RECEIVE (DOWN)
VOX SWITCH	OFF (OUT)
NOISE BLANKER (NB) SWITCH	OFF
NB LEVEL CONTROL	Completely Counterclockwise
AGC CONTROL	Center (12 o'clock)
PREAMP SWITCH	OFF (OUT)
VFO SWITCH	A (OUT)
TUNING RATE SWITCHES	Desired Rate
MODE SWITCH	SSB-NOR
AF GAIN CONTROL	Completely Counterclockwise
RF GAIN CONTROL	Completely Clockwise
SQUELCH CONTROL	Completely Counterclockwise
TONE CONTROL	Center (12 o'clock)
P.B. SHIFT CONTROL	Center position
BAND SWITCH	Desired Band
RIT SWITCH	OFF
XIT SWITCH	OFF
SPLIT SWITCH	OFF (OUT)
DIAL LOCK SWITCH	OFF (OUT)
MEMORY SWITCH	OFF (OUT)
PBT SWITCH	IF SHIFT (OUT)
FILTER SWITCH	OFF (OUT)
NOTCH FILTER SWITCH	OFF (OUT)

Now turn ON the power switch. The meter lamp will be illuminated and 7.10.15 will be shown on the FREQUENCY display (when 7MHz and LSB are selected).

In SSB operation there is both a USB (upper side band) and an LSB (lower side band). LSB is usually used on the 3.5 and 7MHz bands, while USB is usually used on the 10MHz band and above.

Slowly turn the AF GAIN control clockwise to a comfortable level. Rotate the tuning knob until a signal is received. The meter needle will move according to the signal strength, so tune for the highest possible meter reading and the clearest audio. If you cannot get a clear signal, you may be receiving in the opposite sideband. If so, change the mode to the proper sideband.

5 - 2 - 2 NB (NOISE BLANKER)

Set the NB (noise blanker) switch in the NOR position when there is pulse type noise, such as ignition noise from automobile motors, and turn the NB LEVEL control clockwise so that noise will be suppressed and even weak signals will be received comfortably.

When the NB switch is set in the WIDE position, the noise blanker will effectively work for "woodpecker's noise", however, if the receiving signal is too strong, the noise blanker may work with the receiving signal itself, and some distortion may cause in the receiving audio or keying form. At this time, set the N.B. Switch in the NOR position, or turn the NB switch OFF.

5 - 2 - 3 AGC (AUTOMATIC GAIN CONTROL)

The IC-740 has a fast attack/slow release AGC system which holds the peak voltage of rectified IF signals from the IF amp circuit for a certain period. Therefore, during the pauses in normal speech of the received signal, uncomfortable noise will not be heard. The meter indicates the peak value for a certain period, facilitating reading of the meter "S" function.

For normal SSB reception, turn the AGC control clockwise to the SLOW position. Turn the AGC control counterclockwise to the FAST position, when tuning or receiving signals with short interval fading. When in the FAST position, the time constant is shortened.

When this control is set at the OFF position, the AGC circuit is turned OFF, and the S-meter does not work even if a signal is received. However the RF GAIN control is still active and the needle of the meter moves depending on the control position.

5 - 2 - 4 PREAMP SWITCH

Turn the PREAMP Switch ON (in) when receiving weak signals. In the ON position, an RF preamplifier is inserted into the receiving antenna circuit, increasing sensitivity and giving easy reception.

5 - 2 - 5 PASS-BAND SHIFT CONTROL

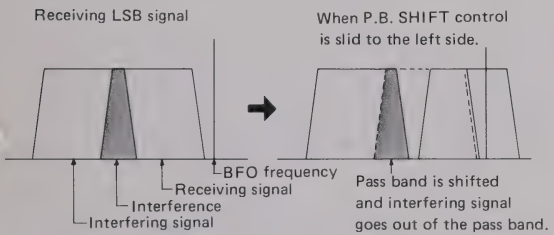
Pass-Band Shift Control is a system in the receive mode to shift the pass-band of the IF upper or lower side continuously. This is very effective in reducing interference from nearby signals.

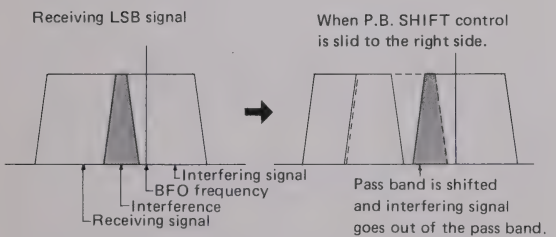
To use the Pass-Band (IF) Shift system, set the PBT switch in the IF (out) position and slide the control toward right or left side. The center position is the normal pass-band condition.

For example, while receiving in the LSB mode, if you get interference from a lower frequency (interfering signals are high pitched tones), shift the pass-band by sliding the P.B. SHIFT control to the left side. When the interfering signals are low-pitched tones, they are from a higher frequency, and you should shift the pass-band by sliding the P.B. SHIFT control to the right side.

When receiving in the USB mode, the pass-band is shifted in the opposite manner. Interference from a higher frequency will be high-pitched tones, and the P.B. SHIFT control should be slid to the right side. Interference from a lower frequency will be low-pitched tones and the P.B. SHIFT control is slid to the left side.

This control can also be used for audio tone adjustment, so it may be set for the most comfortable reception.

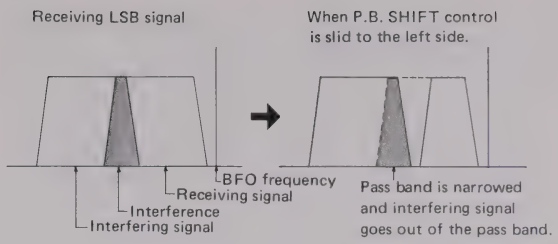

Receiving LSB signal
When P.B. SHIFT control is slid to the left side.
BFO frequency
Receiving signal
Interference
Interfering signal
Pass band is shifted and interfering signal goes out of the pass band.

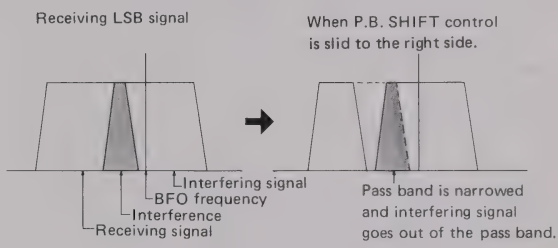

Receiving LSB signal
When P.B. SHIFT control is slid to the right side.
Interfering signal
BFO frequency
Interference
Receiving signal
Pass band is shifted and interfering signal goes out of the pass band.

When the PBT switch is set in the PBT (in) position, the Pass-Band Shift system will be changed to the Pass-Band Tuning system.

The Pass-Band Tuning (PBT) is a system in the receive mode to narrow the band width (selectivity) of the frequencies that will pass through the crystal filter electronically from either the upper or lower side continuously by up to 800Hz. This is very effective in reducing interference from nearby signals.

To use the PBT system, slide the control the same as the Pass-Band Shift system.
The center position is the widest position and is equivalent to the normal SSB band width.


Receiving LSB signal
When P.B. SHIFT control is slid to the left side.
BFO frequency
Receiving signal
Interference
Interfering signal
Pass band is narrowed and interfering signal goes out of the pass band.


Receiving LSB signal
When P.B. SHIFT control is slid to the right side.
Interfering signal
BFO frequency
Interference
Receiving signal
Pass band is narrowed and interfering signal goes out of the pass band.

5-2-6 FILTER SWITCH

This switch selects the combination of the internal filters. When an optional filter is installed, this function will be more effective. Select and install the optional filter(s) to suit your favorite mode(s).

5-2-7 NOTCH FILTER

This circuit notches a frequency in the IF pass-band, so this is effective to reduce interference such as a beat-tone signal.

To use this function, push the NOTCH FILTER switch ON and slide the NOTCH FILTER control so that the interference is reduced.

5-2-8 TRANSMITTING

Before transmitting, listen in the receive mode to make sure your transmission will not interfere with other communications. If possible, use a dummy load for adjustment instead of an antenna. Set knobs and switches as follows.

MIC GAIN	CENTER (12 o'clock) position
RF POWER CONTROL	FULLY COUNTERCLOCKWISE
METER SWITCH	ALC

Other knobs and switches are left in the same positions as for receiving. When the T/R switch is moved to transmit, or when the PTT (push to talk) switch on the microphone is depressed, the TRANSMIT Indicator is illuminated. By speaking into the microphone, the meter needle will move according to the strength of your voice and SSB signals will be transmitted. Set the MIC GAIN control so that the meter needle stays well within the ALC zone at voice peaks. If you wish to increase the output power, turn the RF POWER Control clockwise and adjust to obtain the desired RF output power of between 10 watts and 100 watts (approximately).

Change to the receive mode by moving the T/R switch to receive, or release the microphone PTT switch.

5-2-7 HOW TO USE THE SPEECH PROCESSOR

The IC-740 has a low distortion AF speech processor which enables greater talk power and better results in DX operation. Follow the steps below for use of the Speech Processor:

MIC GAIN CONTROL	CENTER (12 o'clock)
RF POWER CONTROL	Fully Counterclockwise
COMP SWITCH	ON
METER SWITCH	COMP

Switch to transmit and turn the RF POWER CONTROL clockwise while speaking into the microphone until you obtain the desired RF "PEAK" output power of between 10 watts and 100 watts (approximately).

Adjust the MIC GAIN CONTROL to a point where the meter needle just begins to move.

The Speech Processor should be turned OFF or MIC GAIN CONTROL carefully set for minimum compression for all communication other than DX operation for a very natural voice quality.

5-2-10 HOW TO USE THE VOX CIRCUIT

The IC-740 has a built-in VOX (voice operated relay) which allows automatic T/R switching by voice signals into the microphone. For VOX use, set the knobs and switch as follows:

VOX GAIN CONTROL
FULLY COUNTERCLOCKWISE
VOX DELAY CONTROL
FULLY CLOCKWISE
ANTI VOX CONTROL (on the top)
FULLY COUNTERCLOCKWIS

Push the VOX switch on the front panel to the ON (in) position. Leaving the T/R switch in the RECEIVE position and without pushing the PTT switch, turn the VOX GAIN control clockwise while speaking into the microphone. At a certain point, the T/R switching circuit will be activated by your voice. This is the proper position for the VOX GAIN control. Set the VOX GAIN control at a level which provides for T/R switching at your normal voice level. Transmit-release time (the time delay before the set automatically returns to receive when you stop talking) is controlled by the VOX DELAY control. Turning the control counterclockwise makes the time shorter. Set it at a position which is comfortable and which allows for short pauses in normal speech.

Adjust the ANTI VOX control so that the VOX circuit is not activated by sounds from the speaker by turning the control clockwise while receiving a signal.

5-2-12 MONITOR

The transmitting IF signals can be monitored in the SSB mode. So you can check the quality of the transmitting signals and conditions of the speech processor and so on.

To use this function, turn the MONITOR switch on the top cover ON and adjust the AF GAIN control to a comfortable audio level. At this time, use headphones to prevent howling which will be caused by picking up sounds from the speaker.

5-3 CW OPERATION

5-3-1 RECEIVING

For CW reception, set the MODE Switch for CW mode.

Other switches and knobs are set the same as for SSB reception.

In addition to the crystal band-pass filter, Narrow filters are optional for this unit. When the FILTER Switch is set at the ON (in) position, this filter is activated and the total selectivity of CW reception is improved. With these filters, internal noise is reduced for comfortable CW reception and an improved signal to noise ratio (S/N).

Also, use the Noise Blanker, AGC switch and/or PREAMP Switch depending on the receiving conditions, the same as SSB reception.

5-3-2 TRANSMITTING

Insert the keyer plug into the KEY Jack on the rear panel of the unit, and set knobs and switches as follows:

RF POWER CONTROL	Fully counterclockwise
METER SWITCH	RF
VOX GAIN/KEYER SPEED CONTROL	OFF

Other knobs and switches are set the same as for CW reception.

By setting the T/R switch to TRANSMIT, the TRANSMIT indicator is lit and shows that you are ready for CW transmission. When you key the keyer, the meter needle moves and your CW signal is transmitted. To increase the transmitting power, turn the RF POWER Control clockwise to adjust while watching the meter needle on the Po scale for the desired output power.

When the optional keyer unit is installed, connect an iambic paddle with the supplied 3-P key plug to the KEY jack on the rear panel.

Then adjust keying speed by turning the VOX GAIN/ KEYER SPEED CONTROL clockwise for your favorite keying speed.

The other procedures are the same when using a hand keyer or an external electronic keyer.

5-3-3 CW SIDE-TONE (MONITOR)

When keying the side-tone oscillator is activated and an 800Hz tone will be heard. The loudness of the tone is controlled by the CW MONI Control located under the top cover. Rotating the control clockwise will increase the loudness. This tone is also audible in the receive mode and can be used for code practice, adjustment of the keyer, etc.

5-3-4 SEMI BREAK-IN OPERATION

The IC-740 has Semi Break-In CW capability when using the VOX function. When keying, the unit is automatically set in the transmit mode. After keying, it is returned to the receive mode, also automatically, after a given transmit-release delay time constant. Leave the T/R switch in the RECEIVE position, and set the VOX switch in the ON (IN) position.

The transmit release delay time constant is set by adjusting the VOX DELAY Control. Turning the VOX DELAY Control clockwise will make the transmit release time longer. Set it for your own keying speed.

5-4 RTTY OPERATION

For RTTY operation, a teletypewriter and a demodulator (terminal unit) which is operational with audio input are required. Any demodulator with 2125/2295Hz filters (narrow, 170Hz shift) can be used with the IC-740.

5-4-1 RECEIVING

Audio signals for the demodulator can be supplied from Pin 4 of the ACC socket on the rear panel, or from the PHONES jack on the front panel. The level of the audio signals from Pin 4 of the ACC socket does not vary by turning the AF GAIN Control, and the level is about 300mV P-P maximum.

Set the operating mode for RTTY, by setting the MODE SELECT switch to "RTTY". The other controls are the same as those for SSB reception. When tuning a RTTY signal, set the TUNING RATE SELECT switch in the 10Hz position, and tune to get audio signals of 2125Hz for MARK and 2295Hz for SPACE. (Use the tuning indicator of the terminal unit for easy tuning.) Also slide the P.B. Tune control for clear reception.

5-4-2 TRANSMITTING

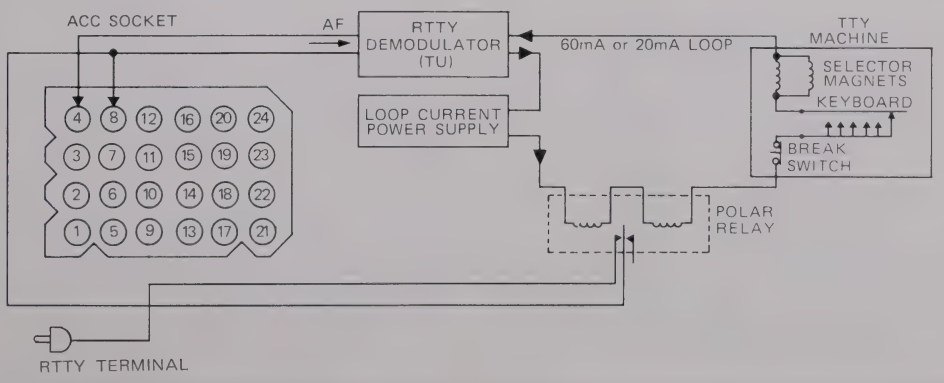
For keying of the Frequency Shift Keying (FSK) circuit insert a high speed relay's coil into the loop current circuit of the teletypewriter, and connect the relay contacts to the RTTY keying terminal on the rear panel. The relay contacts make during the Space and break during the Mark, as shown in the drawing. Fine adjustment of the MARK and SPACE frequencies can be done by adjusting the coil cores in the MAIN unit.

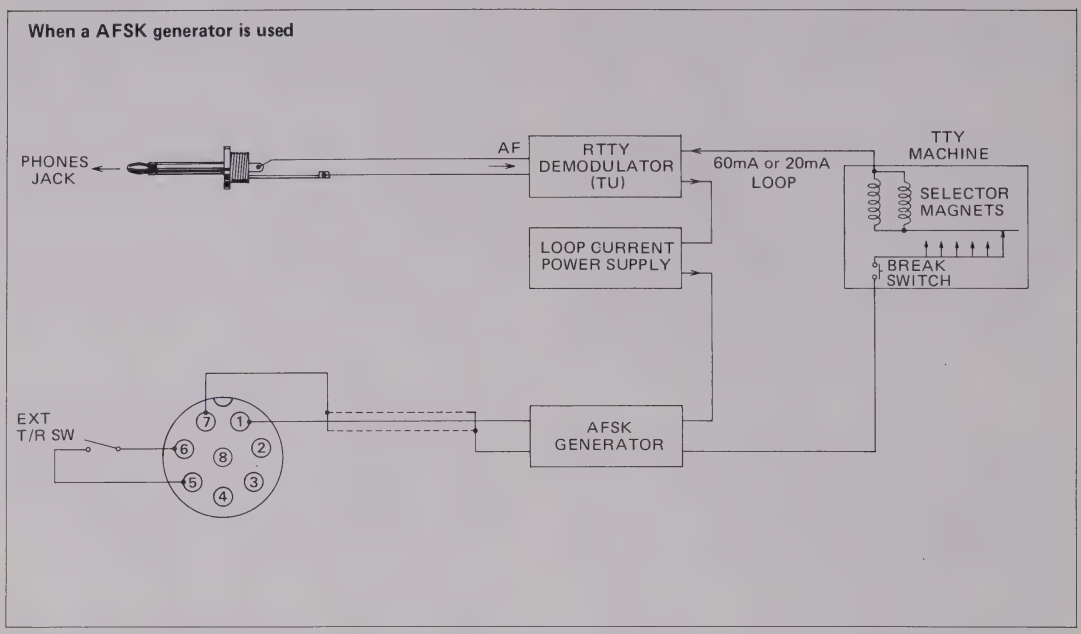
When a level converter for TTL level signals is used, connect the output of the converter to the RTTY keying terminal apply High level (5V) signals for the Mark, and Low (0V) for the Space.

When using an AFSK generator that has 2125Hz for Mark and 2295Hz for Space, connect the output signals for the AFSK to the Mic connector on the front panel and set the Mode to LSB. (See Other Operations chapter.) Doing this, you can use the VOX operation available in this mode, and receive/transmit changeover is very easy.

If you wish to transmit continuously 10 minutes or more, reduce the output power to less than 70% of the full power, by rotating the RF POWER control on the front panel.

When a high speed relay is used





5 - 5 FM OPERATION (OPTION)

5 - 5 - 1 RECEIVING

Set the operating mode for FM, by setting the MODE SELECT switch to "FM". The other controls are the same as those for SSB reception, however, the Pass Band Shift (Tune) control, Notch Filter, Noise Blanker and AGC circuits do not work in this mode.

When tuning an FM signal, tune for maximum signal strength as indicated on the meter and the clearest audio.

5 - 5 - 2 TRANSMITTING

Transmitting FM signals is essentially the same as SSB transmission.
Set knobs and switches the same as for SSB operation. However the speech processor can not be used on this mode.

When transmitting the FM signals, the meter (in RF position) will indicate the carrier power, but the meter needle does not move according to your voice such as SSB transmitting.

5 - 6 OTHER OPERATIONS

5 - 6 - 1 VSWR READING

The IC-740 has a built-in VSWR meter for checking antenna matching in order to avoid problems caused by VSWR. Set the METER SELECT switch to the SET position. Set the operating mode to RTTY, and turn the TRANSMIT/RECEIVE switch to TRANSMIT.

Adjust the RF POWER control so that the meter needle points to "SET" on the meter scale. Set the METER SELECT switch to the SWR position. With the switch in the SWR position, SWR reading can be seen on the meter. Although this unit is built to handle VSWR of up to 2:1, it is recommended that the antenna(s) be adjusted for the lowest possible VSWR. After taking the reading, return the switch to the other position. ALSO BE SURE THAT THE ANTENNA IMPEDANCE IS 50 OHMS OR THERE MAY NOT BE ANY OUTPUT. OTHERWISE THERE WILL BE DAMAGE TO THE TRANSCEIVER.

The final transistors used in the IC-740 are of good design and are protected to a reasonable extent by circuits incorporated in the set. These devices can be expected to have an indefinite lifetime since there are no cathodes to burn out. Under some conditions, however, they can be abused beyond tolerance and may have to be replaced.

When in doubt about antenna systems, use the lowest power setting possible to achieve meaningful readings. Use a good tuner or transmatch when necessary. Always use caution and exercise judgement when testing RF power generators.

5 - 6 - 2 WWV RECEPTION

To receive WWV (or other standard frequency station), set the operating band to 10MHz in the HAM band, and the MODE to any mode. Tune to 10.000.0MHz on the frequency display.

The WWV signal can be used for alignment of a frequency counter, marker oscillator, or the frequency display.

5-6-3 SIMPLE FREQUENCY ALIGNMENT

A very accurate frequency counter is necessary to align the frequency of the IC-740. However, the frequency can be aligned simply by receiving the WWV signal.

1. Set the frequency display to 10.000.0MHz and be sure that you are receiving the WWV signal.
2. Set the operating mode to CW. A 800Hz beat can be heard.
3. Short the KEY Jack on the rear panel so that the CW side-tone also becomes audible.
4. Rotate the CALIBRATOR Control, located on the top cover, so that the two tones are of the same pitch (in zero beat). If the tones are difficult to adjust because of a difference in their strengths, adjust the CW side-tone level with the CW MONI control, located on the MAIN unit (under the top cover), until the strengths are the same.

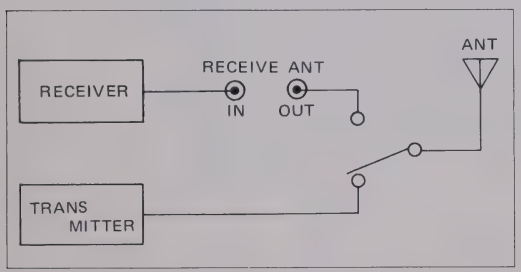
When the optional marker unit, IC-EX241 is installed, operating frequency can be calibrated each 25KHz or 100KHz on the all bands.

WHEN ALIGNING THE FREQUENCY, DO NOT PUT THE UNIT IN THE TRANSMIT MODE.

Be sure the T/R switch is in the Receive position, the VOX switch is OFF, and that you do not touch the PTT switch on the microphone.

5-6-4 RECEIVE ANTENNA TERMINALS

The RECEIVE ANT IN jack is connected to the input terminal of the receiving section, and the RECEIVE ANT OUT jack is connected to the antenna connector through the internal T/R antenna switching circuit.



These two jacks are normally jumpered with a cable, but can be used for:

1. A receiving preamplifier.
2. A separate receiver.
3. Separate receiver and transmitter antennas.

If you wish to use a receiver preamplifier, connect it between the receiver input and antenna output terminals.

If a separate receiver is used, connect it to the receiver antenna output terminal. For a separate receive antenna connect it to the receiver input terminal.

5-6-5 TRANSVERTER CONNECTION

When a transverter control signal (+8V) is applied to Pin 11 of the ACCESSORY socket, the TRANSVERTER terminal can be used for a VHF/UHF transverter INPUT/OUTPUT terminal.

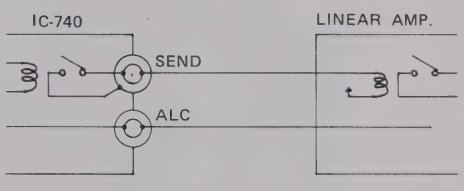
The transverter's input/output frequency and signal level should be as follows:

- Transverter INPUT/OUTPUT Frequency
  28 ~ 30MHz
- Input/Output Level
  Transmit (Output) : Max. 150mV across a 50 ohm load
  Receive (Input) : 1μV for S/N 10dB

5-6-6 LINEAR AMPLIFIER CONNECTION

The jacks on the rear panel marked "ALC" and "SEND" are a relay built-in for keying a linear amplifier, and the input for ALC from the linear amplifier. For linear amplifier hookup the SEND jack is for an internal relay and the ALC jack is for ALC input.

Internal Connections for Linear Amplifier



The optional linear amplifier IC-2KL and automatic antenna tuner IC-AT100/AT500 can be connected to the IC-740 with their accessory cables as same as other ICOM HF transceivers. Refer to their instruction manuals for detail.

The IC-740 puts out the band control voltage to change operating band automatically for external equipment such as linear amplifier and antenna tuner. The voltage is put out from Pin 13 of the accessory socket. (Refer to page 10.)

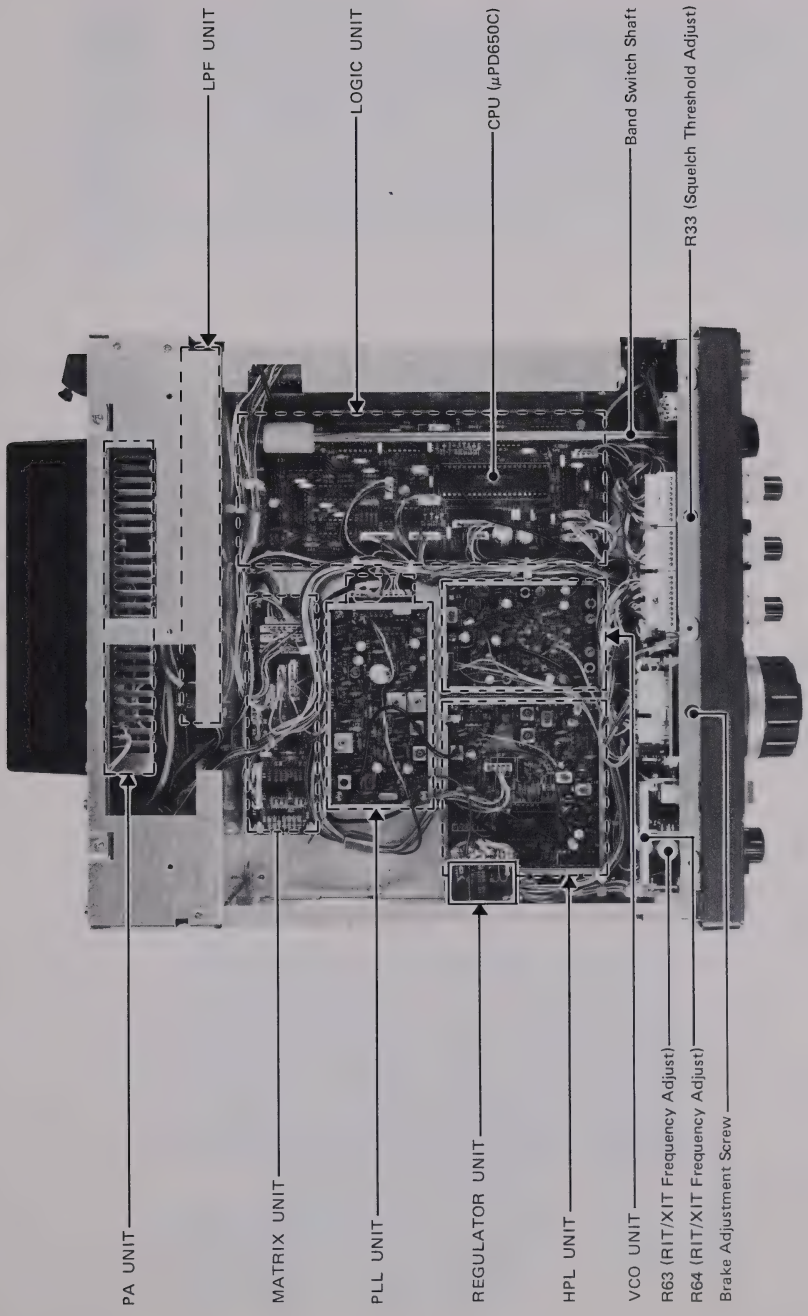
Band Control Voltage Chart

BAND (MHz)	Band Control Voltage
1.8	7.0 ~ 8.0V
3.5	6.0 ~ 6.5V
7	5.0 ~ 5.5V
14	4.0 ~ 4.5V
18 - 21	3.0 ~ 3.5V
24 - 28	2.0 ~ 2.5V
10	0 ~ 1.2V

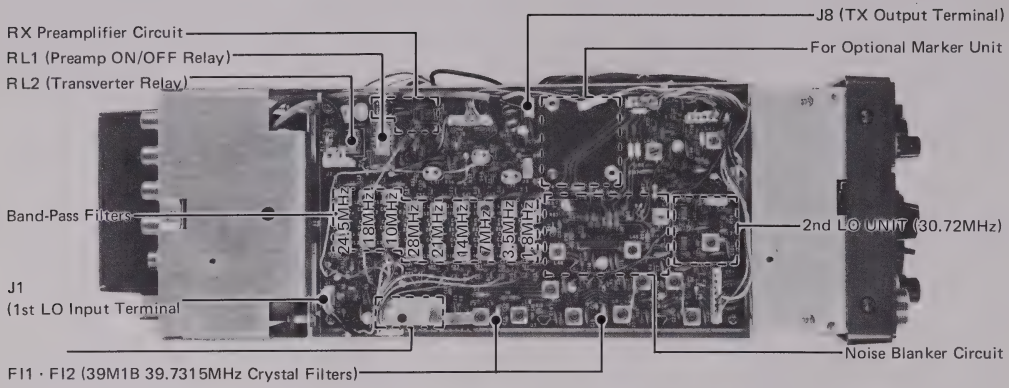
6-1 TOP VIEW

R209 (RX RF Gain Adjust)
R6 (RX RF Gain Adjust)
R15 (Carrier Null Adjust)
R16 (Carrier Null Adjust)
R191 (LDA Voltage Adjust)
R111 (CW AF Filter Gain Adjust)
IC10 (AF Power Amp μPC1181H)
R206 (TX 100W Adjust)
R204 (TX 50W Adjust)
S1 (100W/50W Switch)
S2 (Cooling Fan Switch)
R164 (TX 10W Adjust)
R146 (Ic Meter Full Scale Adjust)
R147 (ALC Level Adjust)
R180 (ALC Meter Adjust)
R144 (Ic Meter Zero Adjust)
R128 (S-Meter Full Scale Adjust)
R127 (S-Meter S9 Adjust)
R133 (CW Monitor Volume Control)
C37 (X1 RTTY-Space Freq. Adjust)
X1 (9.01167MHz BFO Crystal)
C48 (X3 LSB Frequency Adjust)
X3 (9.010MHz BFO Crystal)
X2 (9.013MHz BFO Crystal)
C45 (X2 USB Frequency Adjust)
R42 (Monitor Volume Control)
MAIN UNIT
For Optional FM Unit
For Optional 455KHz Crystal Filter
Filter Selection Connector Pins
F12 (CFJ455K Ceramic Filter)
X1 (CR12A Notch Filter)
IF UNIT
X2 (9.4665MHz 3rd LO Crystal)
For Optional 9MHz CW Crystal Filter
F11 (9M22D2 Crystal Filter)
F13 (9M15A Crystal Filter)
Filter Selection Output Terminals
J20 (Filter Selection Jack)
J31 (Filter Selection Jack)
Filter Selection Connector Pins
For Optional Electronic Keyer Unit

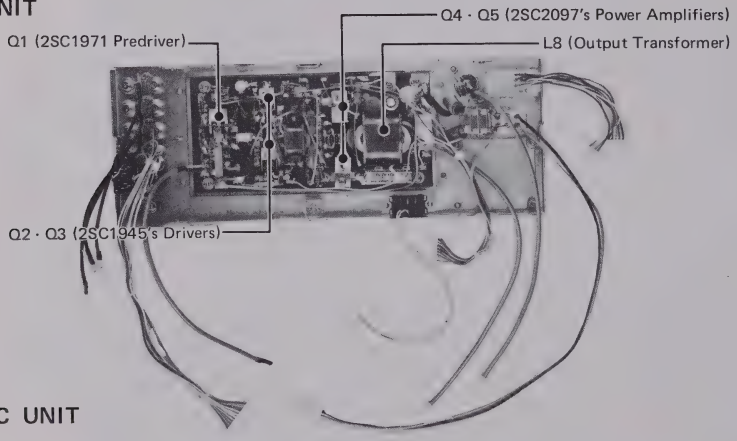
6-2 BOTTOM VIEW



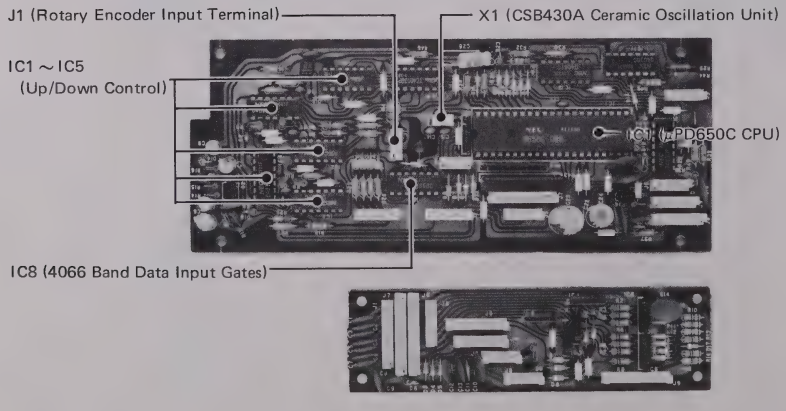
6 - 3 RF UNIT



6 - 4 PA UNIT

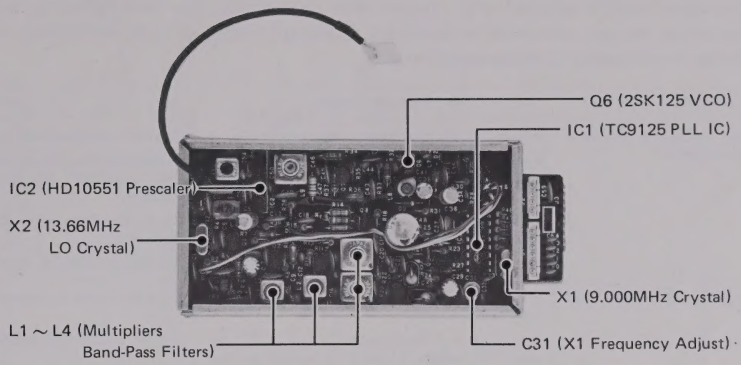


6 - 5 LOGIC UNIT

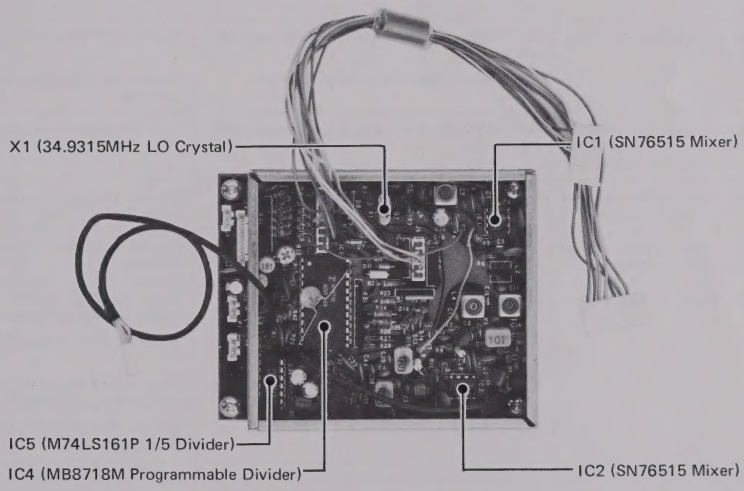

J1 (Rotary Encoder Input Terminal)
IC1 ~ IC5
(Up/Down Control)
IC8 (4066 Band Data Input Gates)
X1 (CSB430A Ceramic Oscillation Unit)
IC7 (μPD650C CPU)

BAND MATRIX UNIT

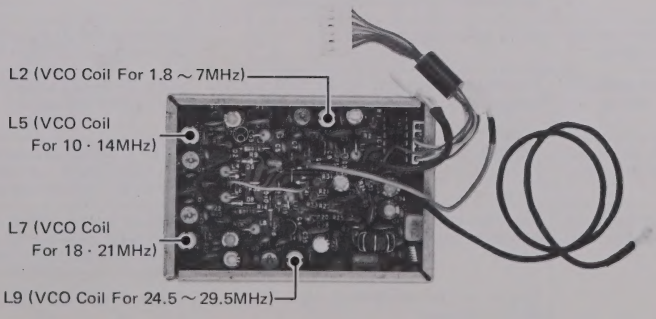
6-6 PLL UNIT



6-7 HPL UNIT



6-8 VCO UNIT

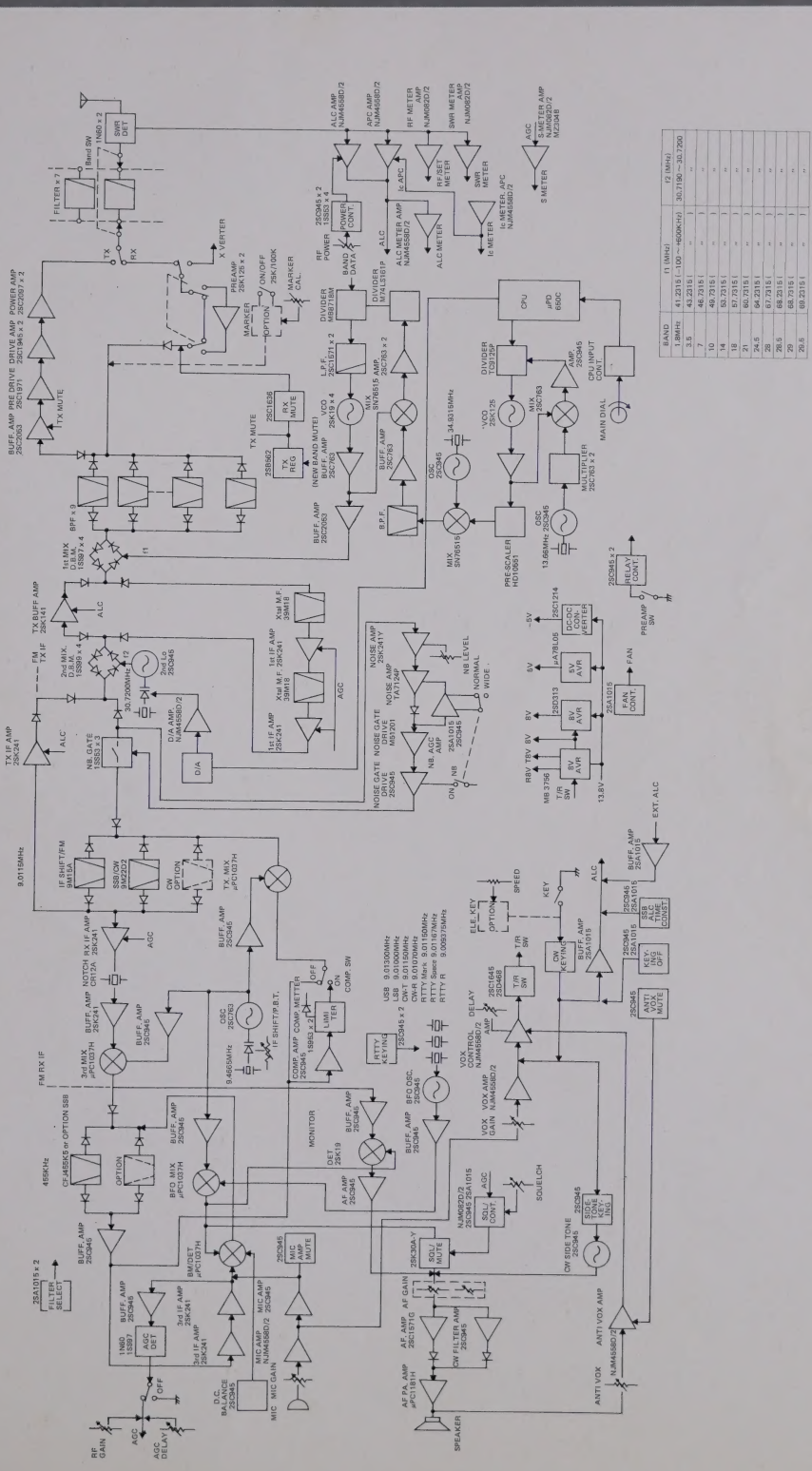


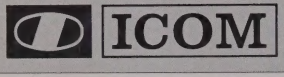
SECTION 7 TROUBLESHOOTING

Your IC-740 has been carefully adjusted at the factory prior to shipping. The chart below has been provided to help you correct problems which are not equipment malfunctions. If you are unable to locate the trouble, or correct the fault, please contact your dealer or the nearest ICOM Service Center.

Problem	Possible Cause	Solution
1. Power does not come on when the switch is pushed.	Power cable is improperly connected.	Carefully reconnect power cable.
	Power cord is connected with the polarity reversed.	Disconnect the power cord, replace the blown fuse, then reconnect the power cord observing proper polarity.
	Blown fuse.	Check for the cause, then replace the fuse with a spare one.
		If using an IC-PS15, also check its fuse.
2. No sound comes from the speaker.	AF GAIN control knob is completely counterclockwise.	Turn the knob clockwise to a suitable level.
	The unit is in the transmit mode, either by the T/R switch or the PTT switch on the microphone.	Put the unit in the receive mode.
	The external speaker cable is connected to the unit but not to the external speaker jack on the external speaker.	Connect the cable to the speaker jack on the external speaker.
	The internal speaker cable is not connected.	Connect the speaker connection.
	A headphone is connected to the PHONES jack.	Unplug the headphone.
3. Sensitivity is low and only strong signals are audible.	RF GAIN control knob is turned counter-clockwise.	Turn the RF Gain control knob fully clockwise.
	The antenna feed line is cut or shorted.	Check the feed line and correct any improper condition.
4. During receive, the "S" meter is higher than the "0" position even when there is no signal.	RF GAIN control knob is turned counter-clockwise.	Turn the knob fully clockwise.
5. Only incomprehensible voices are heard during SSB reception.	Receiving the wrong sideband.	Set the sideband opposite the one you are using, either USB or LSB.
6. The tone of the received signal is very high or low pitched.	Maladjustment of the P.B. Shift control.	Set the P.B. Shift control knob to the clear tone position.
7. No output power or low output power.	MIC GAIN setting is too low.	Turn the MIC GAIN control clockwise to the center (12 o'clock) position, or more.
	When SSB is desired, but the MODE is in the CW.	Set the MODE to the SSB (USB or LSB).
	PTT switch is not functioning due to improper connection of the mic connector.	Check the connection of the MIC connector and correct any problems.
	The antenna feed line is cut or shorted.	Check the antenna feed line and correct any improper connection.
8. The receive mode functions properly and your signals are transmitted, but you are unable to make contact with another station.	The SPLIT switch is pushed in.	Set the SPLIT switch to the out position.
	The receive frequency is offset from the transmit frequency by the Incremental Tuning control.	Turn OFF the RIT and/or XIT, or set the control knob to the center (12 o'clock) position.
9. The heatsink on the rear panel becomes hot.	The heatsink on the rear panel is for the final transistors and may become as hot as 40°C (104°F) above room temperature.	Make sure the area around the unit has as much ventilation as possible.
10. The frequency does not change by rotating the Tuning knob.	DIAL LOCK is engaged.	Disengage the DIAL LOCK by pressing and releasing the DIAL LOCK switch.
11. An abnormal figure is displayed on the frequency display or fails to illuminate.	The Power switch was turned OFF and ON too quickly.	Turn the Power switch OFF, wait 30 seconds, and then turn it ON again.
12. An unusual amount of distortion and/or noise in the transmit signal.	The MIC GAIN is too high when the Speech Processor is ON.	While watching the meter in the ALC mode, turn the MIC GAIN control counterclockwise so that the meter is within marked zone at the voice peak.
13. Unable to key when using an electronic keyer or hand key.	The Switching circuit of the external electronic keyer does not close completely.	Replace the keyer with one having a voltage of less than 0.4V between the two keying lines at the key down condition, or modify your keyer so that the voltage is less than 0.4 Volts.
	Polarity of the connection wires from the keyer is reversed.	Connect the keyer wires observing proper polarity.
	The MODE is not in the CW.	Place the MODE in the CW.
	The VOX GAIN/KEYER SPEED control is not in the OFF position.	Place the control in the OFF position.

SECTION 8 BLOCK DIAGRAM


BAND
(MHz)
f1 (MHz)
f2 (MHz)
1.8
41.2315 (–100 – +600kHz)
30.7190 – 30.7200
3.5
43.2315
7
46.7315
10
49.7315
14
53.7315
18
57.7315
21
60.7315
24.5
64.2315
28.5
68.2315
29
68.7315
29.6
69.2315
1st MIX
2nd MIX
3rd MIX
FM TX IF
FM RX IF
TX BUFF AMP
TX IF AMP
PRE DRIVE
DRIVE AMP
POWER AMP
BUFF. AMP
1st IF AMP
2nd IF AMP
3rd IF AMP
AF AMP
AF PA AMP
MIC AMP
VOX AMP
VOX GAIN
VOX CONTROL
ANTI VOX AMP
ANTI VOX
ANTI MUTE
SQUELCH
SQU/CONT
SQU/MUTE
CW FILTER AMP
CW SIDE TONE
CW KEYING
KEY-OFF
SSB TIME CONST
ELE. KEY
KEY
T/R SW
DELAY
RTTY KEYING
RTTY
BFO OSC.
BFO MIX
MONITOR
DET
BM/DET
IF SHIFT/P.B.T.
COMP. AMP
COMP. METER
COMP. SW
NOTCH
IF SHIFT/FM
SSB/CW
CW OPTION
TX MIX
NOISE AMP
NOISE GATE
NB. AGC
NB. LEVEL
NORMAL
WIDE
NB. GATE
D/A
D/A AMP
AGC
AGC DET
AGC DELAY
RF GAIN
D.C. BALANCE
MIC GAIN
MIC
SPEAKER
CERAMIC FILTER
FILTER SELECT
OPTION
PREAMP
MARKER
MARKER CAL.
X METER
SWR DET
Band SW
TX MUTE
RX MUTE
TX REG
RX
TX
ON/OFF
PRESCALER
MULTIPLIER
MAIN DIAL
CPU
DIVIDER
VCO
MIX
OSC
B.P.F.
L.P.F.
BUFF. AMP
DIVIDER MB87018
DIVIDER MB87019
DIVIDER TC9125P
PLL
RF POWER
BAND DATA
POWER CONT
ALC AMP
ALC METER AMP
APC AMP
RF METER AMP
SWR METER AMP
AGC
S METER AMP
Ic METER APC
ALC METER
RF METER
SWR METER
S METER
CPU INPUT CONT
RELAY CONT
PREAMP SW
FAN
FAN CONT
DC/DC CONVERTER
EXT. ALC
ON/OFF
NB
NB LEVEL
NORMAL
WIDE
NOISE GATE
NOISE AMP
NB. AGC
IF SHIFT/P.B.T.
COMP. METER
COMP. SW
OFF
ON
LIMITER
MONITOR
DET
BM/DET
MIC AMP MUTE
SQU/CONT
SQU/MUTE
AGC
KEY
KEY-OFF
SSB TIME CONST
ANTI MUTE
ANTI VOX
ANTI VOX AMP
VOX GAIN
VOX CONTROL
DELAY
RTTY KEYING
BFO OSC.
BFO MIX
MONITOR
DET
AF AMP
AF GAIN
AF PA AMP
SPEAKER
MIC
MIC GAIN
MIC AMP
D.C. BALANCE
AGC DET
AGC DELAY
RF GAIN
CW FILTER AMP
CW SIDE TONE
CW KEYING
SQUELCH
SQU/CONT
SQU/MUTE
FILTER SELECT
OPTION
CERAMIC FILTER
IF SHIFT/FM
SSB/CW
CW OPTION
TX MIX
NOTCH
NOISE AMP
NOISE GATE
NB. AGC
NB. LEVEL
NORMAL
WIDE
D/A
D/A AMP
AGC
NB. GATE
TX IF AMP
TX BUFF AMP
FM TX IF
FM RX IF
1st MIX
2nd MIX
3rd MIX
1st IF AMP
2nd IF AMP
3rd IF AMP
AF AMP
AF PA AMP
MIC AMP
VOX AMP
VOX GAIN
VOX CONTROL
ANTI VOX AMP
ANTI VOX
ANTI MUTE
SQUELCH
SQU/CONT
SQU/MUTE
CW FILTER AMP
CW SIDE TONE
CW KEYING
KEY-OFF
SSB TIME CONST
ELE. KEY
KEY
T/R SW
DELAY
RTTY KEYING
BFO OSC.
BFO MIX
MONITOR
DET
BM/DET
IF SHIFT/P.B.T.
COMP. AMP
COMP. METER
COMP. SW
NOTCH
IF SHIFT/FM
SSB/CW
CW OPTION
TX MIX
NOISE AMP
NOISE GATE
NB. AGC
NB. LEVEL
NORMAL
WIDE
NB. GATE
D/A
D/A AMP
AGC



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